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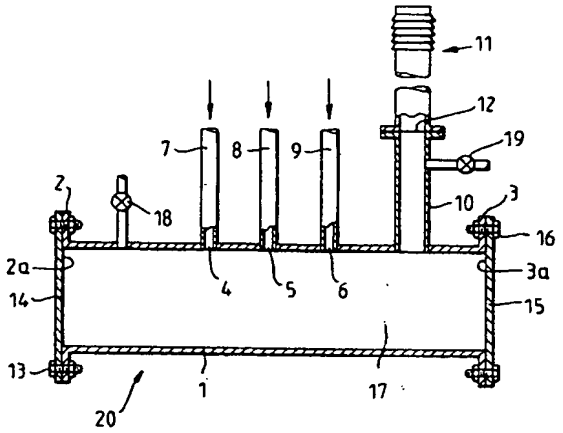
(54) Emergency dump tank for congealable materials.

(57) A dump tank (20) for receiving congealable material vented from a chemical process, the dump tank having two access doors (14, 15) covering two access ports (2a, 3a), both doors being openable for cleaning purposes so that congealable material vented into the tank can be pushed out of one access port from the other port.



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Background of the Invention

1. Field of the Invention

This invention relates to a dump tank and has particular reference to an emergency dump tank for the retention of congealable material.

The invention has further particular, but not necessarily exclusive, reference to a dump tank for use in the containment of solutions of cellulose in aqueous organic compounds - typically n-methyl morpholine n-oxide (NMMO).

Cellulosic fibres have attractive absorbency and comfort characteristics and are widely used in the production of products such as garments and absorbency products. Certain cellulosic fibres occur in nature - such as cotton. Other cellulosic fibres are produced by the formation of a chemical compound of cellulose to produce a spinnable solution which is extruded or spun into a regeneration bath to form the fibres. Viscose rayon is an example of such a fibre.

More recently techniques have been developed for the production of extruded cellulosic products (in particular fibres) by the dissolution of cellulose in an aqueous organic solvent for cellulose. Such fibres have been given the generic term "lyocell fibres".

A preferred solvent for cellulose is a tertiary amine oxide, in particular NMMO.

Although cellulose can form a stable solution in an aqueous n-methyl morpholine solvent, the solution can become an exotherm if the temperature of the solution rises above a predetermined level. Once under way, an exotherm comprises an uncontrollable chemical reaction characterised by the release of excessive quantities of thermal energy in a very short period of time. Because the solution of cellulose in aqueous NMMO is relatively viscous - although thixotropic - one of the characteristics of an exotherm is the displacement of solution as a result of the formation of gases in the exotherm. Unstabilised solutions gradually degrade, in doing so they emit heat. This can cause a runaway reaction once the temperature of the solution reaches about 170°C. Stabilised solutions using stabilisers such as propyl gallate reach runaway reactions temperatures at about 180°C.

Proposals have been made, therefore, to provide safety relief devices to relieve pressure and material in the event of an exotherm.

The present invention is concerned with an emergency dump tank for the retention of congealable material produced, in a particular example, by an exotherm occurring in a pipeline containing a solution of cellulose in aqueous NMMO.

By the term "congealable material" as used herein is meant a material which increases significantly in viscosity on cooling or coming to rest, forming for example a solid or a rubbery mass of material or a material of too high a viscosity to flow or be pumped.

Summary of the Invention

By the present invention there is provided an emergency dump tank for the retention of a congealable material, said tank having defining walls and at least one entry line for said material and a vapour vent line, said vent line being connected to a vapour exit port located in an upper region of said dump tank and having a vent exit open to the atmosphere, a seal to prevent the atmosphere entering said tank via said vapour vent line during non-emergency rest conditions of said tank, said seal being openable under the action of pressure in said dump tank so as to permit said vapour exit to be in gaseous communication with said surrounding atmosphere, an inert atmosphere being maintained in said tank in use, there being at least two openable access ports in said walls so as to permit congealable material which has congealed in said tank to be removed from said tank by opening both of said access ports so that congealed material can be pushed out of one of said ports via the other of said ports.

The inert atmosphere may be nitrogen.

The vent line may be disposed in a substantially vertical line out of the tank. The vent line may be heated so as to be maintained at a temperature in excess of 100°C, preferably in the range 100-125°C.

The present invention also provides a dump tank for the reception of a congealable material vented from a chemical process, in which the tank includes at least one entry line for the entry of congealable material into said tank and a pair of access ports openable in said tank to permit removal of congealable material which has congealed in said tank from said tank by opening both of said access ports and pushing the congealed material from one of said ports through the other of said ports.

The dump tank may be in the form of a cylinder, having flanges surrounding the access ports at both ends, the access ports being closed off with blanking plates bolted or otherwise secured to said flanges.

The present invention yet further provides a process for safely venting a solution of cellulose in an aqueous NMMO solvent from a pipeline following an exotherm of said solution, which process includes the steps of:-

(i) transporting said solution via a heated dump line to a dump tank,

(ii) said dump tank having an entry port for said dump line, a vapour exit port communicating to atmosphere and at least two access ports having openable access doors,

(iii) permitting at least partial cooling and congealing of said solution in said dump tank,

(iv) opening both of said access doors to permit access to said dump tank, and

(v) pushing said at least partially congealed solution out of one of said access ports by pushing

on said at least partially congealed solution through the other of said access ports.

Brief Description of the Drawing

By way of example, an embodiment of the present invention will now be described with reference to the accompanying drawing, which is a cross section of an emergency dump tank.

Description of the Preferred Embodiment

The dump tank 20 illustrated in the drawing comprises a mild steel cylinder 1 having a flange 2,3 surrounding access ports 2a, 3a at each end. Along the length of the cylinder there are a series of ports 4,5 and 6 in communication with entry lines 7, 8 and 9. A vapour vent line 10 is in communication with a chimney stack indicated generally by 11. A thin membrane 12 is located across the vapour vent line 10.

Bolted to the flange 2, by means of bolts 13, is an access door 14. Similarly an access door 15 is bolted by means of bolts 16 to the flange 3.

In use the vent tank is filled with nitrogen at a pressure of 1-3 psig (0.07 to 0.21 kg/cm^2). The emergency vent tank would normally be located conveniently within a chemical plant so that the entry lines 7, 8 and 9 are simply in communication with whatever source of congealable material may be required to be forced, in an emergency, into the dump tank. Typically the lines 7, 8 and 9 are in communication with a pressure relief device.

A typical chemical plant would be one handling a solution of cellulose in an aqueous NMMO solvent. The solution would be piped in pipelines at about 100°C to 115°C, but if the solution experiences a higher temperature, say 135°C for a sufficiently long time, say one hour, an uncontrollable reaction or exotherm can occur with the release of a considerable amount of gases and energy in the form of heat.

In the event of an exotherm, the solution of cellulose in the aqueous NMMO would be forced through one of the entry lines 7, 8 or 9 which are each heated to 100°C and through the ports 4, 5 and 6 into the chamber 17 which is defined by the walls of the dump tank. It has been found to be safest to heat the lines, otherwise if small quantities of solution weep into the lines - for example from a leak in the bursting disc, this can congeal without any indication of a problem, and then block the entry line. Preferably the entry lines are heated to 90 to 120°C preferably 100 to 115°C.

The entry of material into the tank will give rise to a sudden increase in pressure within the dump tank thus bursting the membrane 12 and permitting excess nitrogen and vapour to be vented to atmosphere through the chimney stack 11. A bursting disc rupture detection device can be used to detect the rupture of the disc. Alternatively, the pressure in the tank can be monitored and the loss of pressure occurring following bursting of the membrane 12 can be used to indicate a flow of material into the dump tank. The vent line from the vent tank is provided with a heater, either electrical or hot water, to keep its temperature at about 100°C. The purpose for this is to ensure that there is a free path at all times for the dope to vent with the gasses. One some occasions there may be a secondary exotherm after the first exotherm. The second exotherm may take place a number of hours after the first and so it is important that the vent lines are kept hot to prevent material from the first exotherm cooling and solidifying. As yet we are not aware of a tertiary exotherm occurring. Each entry line 7, 8, 9 should slope downwardly to the chamber 17 to ensure that there are no traps where dope could collect. If required scrubber or absorber means can be provided in the chimney 11 to absorb any unwanted vapours. Typically the scrubber means may comprise activated charcoal.

The membrane 12 is preferably in the form of a thin bursting disc having a low bursting pressure - typically 5 psig (0.35 kg/cm^2).

After an emergency venting has occurred, the chamber 17 will be partially full of a solution of cellulose in NMMO. Because such a material congeals as the temperature falls, a rubbery plug of material will be formed in the chamber 17.

To remove the congealed material, air can be flushed through the tank and then the bolts 13 and 16 are undone so as to permit the access doors 14 and 15 to be removed. The congealed material can then be pushed out from the chamber 17 through the aperture at one end by pushing the material from the aperture at the other end.

This means that the congealed material can be simply and rapidly removed from the emergency dump tank so as to permit a rapid readying of the dump tank for further use as required. Clearly, the less such a dump tank is used the better, however, in the event of a requirement to use it, it is desirable to be able to readily and rapidly empty the dump tank from congealed or partially congealed material so as to permit the dump tank to be reinstated for further operation as required.

After the dump tank has been cleaned out, the access doors 14 and 15 are rebolted into position, a new bursting disc 12 is inserted and sealed in position. A fresh charge of nitrogen is forced into the dump tank via a nitrogen inlet line 18 and out through a closable nitrogen vent valve 19 just below the disc 12. Once the system has been purged of air, the nitrogen vent valve is closed and the system is pressurised to 2 psig (0.14 kg/cm^2). The system is then ready for further use.

More than one dump tank can be provided, and the chimney stacks of the separate dump tanks can be manifolded into a single chimney to form a single

vent to external atmosphere.

Claims

1 A dump tank (20) for the reception of a congealable material vented from a chemical process, characterised in that the tank (20) defines a chamber (17) communicating with at least one entry line (7, 8, 9) for the entry of congealable material into said chamber (17) and a pair of access ports (2a, 3a) openable in said tank to permit removal of congealable material from said chamber (17) by opening both of said access ports (2a, 3a) and pushing congealable material from one of said ports out of the chamber (17) through the other of said ports.

2. A tank as claimed in claim 1, characterised in that the tank is in the form of a cylinder (1) having a flange (2, 3) at each end, the access ports (2a, 3a) being formed by blanking plates (14, 15) secured to said flanges (2, 3).

3. A dump tank as claimed in claim 1 or claim 2, characterised in that said chamber (17) has a vapour vent line (10) connected to a vapour exit port located in an upper region of said chamber (17) which has a vapour exit (11) open to the atmosphere, a seal (12) being provided to prevent the atmosphere entering said chamber (17) via said vapour vent line (10) during non-emergency rest conditions of said tank (20), said seal (12) being openable under the action of a sufficient pressure in said dump tank so as to permit said vapour vent line (10) to be in gaseous communication with said surrounding atmosphere, and means (18, 19) to maintain an inert atmosphere in said chamber (17) in use of said tank.

4. A process for safely venting a solution of cellulose in an aqueous n-methyl morpholine n-oxide solvent from a pipeline following an exotherm of said solution, characterised in that the process includes the steps of:-

(i) transporting said solution via a dump line (7, 8, 9) to a dump tank (20) defining a chamber (17),

(ii) said chamber (17) communicating with an entry port for said dump line (7, 8, 9), a vapour exit port (10) communicating to atmosphere and at least two access ports (2a, 3a) having openable access doors (14, 15).

(iii) permitting at least partial cooling and congealing of said solution in said chamber (17),

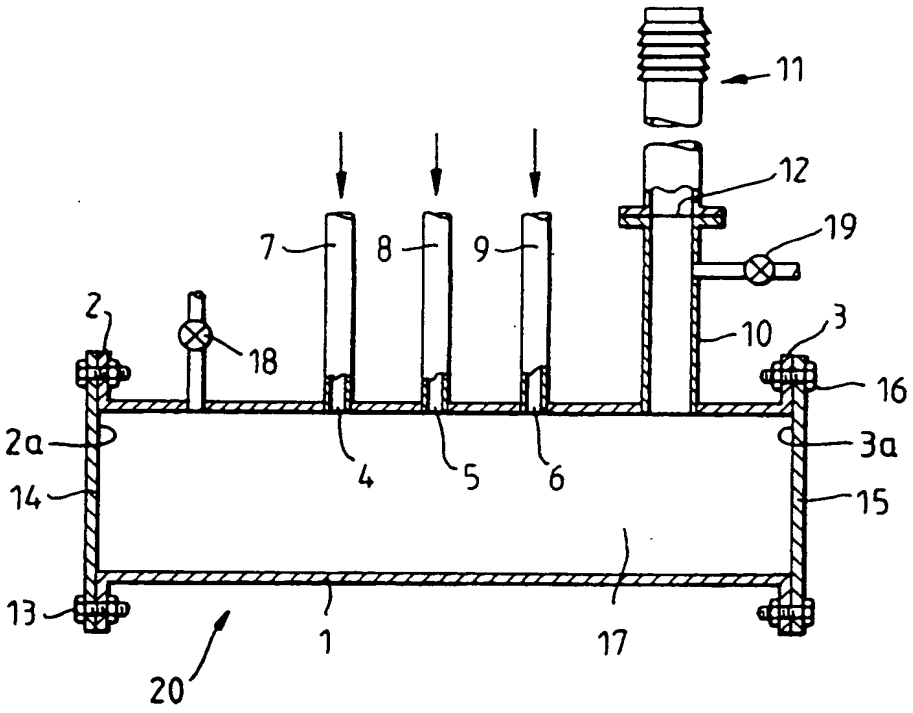
(iv) opening both of said access doors (14, 15) to permit access to said chamber (17), and

(v) pushing said at least partially congealable solution out of the chamber (17) via one of said access ports by pushing on said at least partially congealable solution from the other of said access ports.

5. The process of claim 4, characterised in that the chamber (17) contains an inert atmosphere.

6. The process of claim 4, characterised in that the inert atmosphere is nitrogen.

7. The process of claim 5, characterised in that the vapour exit port (10) communicates to the atmosphere via a line containing a seal (12), said seal (12) being openable under the influence of a sufficient pressure rise within the dump tank.



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EUROPEAN SEARCH REPORT

Application Number
EP 94 30 3606

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	DE-A-18 00 061 (J.V.DANILOV ET AL.) * page 1, paragraph 1 -paragraph 2 * * page 4, paragraph 1 - page 5, paragraph 1 * * figure 1 (ref. 13,14) * -----	1,2	B01J19/00 D01F2/00
			TECHNICAL FIELDS SEARCHED (Int.Cl.5) B01J D01F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19 August 1994	Siem, T

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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